Building Materials Salvage

Environmental and business development opportunity

What is salvage?

In 2007, approximately 300,000 tons of demolition waste was delivered to private and city transfer stations in Seattle, destined for landfill disposal. Among this waste –- thousands of tons of useful materials.

The City of Seattle's Beyond 60 Percent Recycling Resolution (30990) identifies construction and demolition waste as a target for reduction. It calls for specific actions, including the removal of permitting barriers to building salvage and the introduction of incentives to reduce tonnages of construction and demolition waste.

Building salvage is an alternative process to conventional demolition where a structure is carefully dismantled, saving building elements for reuse. Commonly salvaged materials include: structural beams and dimensional lumber, wood flooring, cabinetry, casework and doors, architectural details, brick and stone. Salvage operations can range from selective removal of high-value elements to full scale deconstruction.

Building salvage can be an important additional service a conventional demolition company can offer clients. More customers are becoming environmentally aware, expressing their desire for waste reduction on the job site and utilizing green building rating systems such as LEED™ and Built Green™ that call for waste reduction, salvage and recycling. Furthermore, costs for the disposal of construction and demolition waste is likely to increase going forward as landfill space decreases and transportation costs rise.

Why salvage?

Beyond public and environmental benefits, building salvage can benefit a company's or owner's bottom line. Common benefits include the following.

Competitive advantage. As green building and conservation gain popularity, demand rises for related services. Offering building salvage as a

Definitions

Deconstruction aims to salvage as much material from a project as practicable by fully dismantling a building, to the foundation. It primarily relies on manual labor.

Hybrid deconstruction utilizes heavy equipment to remove entire sections of a building, such as roof and walls, to expose higher value and easier to salvage elements. The remaining materials are recycled or disposed of.

Non-structural salvage focuses on the high-value, primarily interior elements of a building for reuse.

Building Salvage + Deconstruction

The benefits of salvage and reuse of building materials include avoided tipping fees (solid waste disposal), enhanced service offerings for an increasingly green consumer, compliance with green building rating system requirements, and an array of environmental benefits. Learn how to incorporate building materials salvage into your business.

Resources

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www.seattle.gov/dpd/GreenBuilding

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www.greentools.us

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Describes the solid waste and hazardous waste elements of demolition debris.
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Joel Banslaben
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direct or subcontracted service can give a firm an edge in the bidding process.

Potential cost savings.
Salvage costs can be offset in a variety of ways: via the sale of high-value salvaged materials, through tax deductions earned from donation of materials, by using salvaged materials for projects which reduces the need to purchase new, and/or reduced disposal fees.

Marketing benefit.
Consumers are increasingly making purchasing decisions based on the environment. As of 2007, 25 percent of all new homes built in King County were Built Green certified. Positioning your firm as environmentally responsible offers a niche marketing position.

Proactive stance on environmental regulations.
As waste reduction becomes a City priority, more stringent regulations relating to diversion rates may follow. Firms utilizing best practices will be better equipped to adapt to a changing regulatory environment.

Issues to consider

Time.
Extensive salvage takes more time than conventional demolition. Managing expectations up front and building additional time into schedules helps accommodate the added time commitment. The City of Seattle recently created a deconstruction permit whereby salvage and deconstruction work can proceed ahead of construction contingent on the completion of a waste diversion plan.

Health + safety.
As with any demolition project, the building must be evaluated for lead, asbestos and other hazards. Presence of these materials can hamper a salvage operation. Additionally, the manual nature of salvage operations can translate into workplace risks; these are minimized with proper training and education.

Economics.
Crew skill, material quantity, quality and ease of material removal, presence of hazardous materials and other variables can dramatically affect the financial implications of a salvage operation. With the proper tools, experience and knowledge of markets, estimates will be more accurate.

Pilot project findings

This case study series was supported by Seattle Public Utilities and the Washington State Department of Ecology, with the aim of evaluating the cost-effectiveness and waste diversion potential of different salvage approaches. The projects are shown for demonstration purposes; actual costs will vary based on project complexity, location, size, and project team experience. In general, however, the following trends were revealed:

Full deconstruction yields more salvage.
If a project has the time and crew, full deconstruction can yield diversion rates in the high 90s, with substantial percentages of reusable materials.

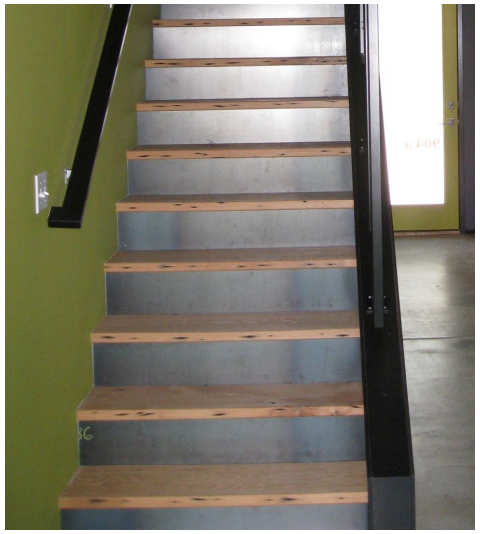
Time frame is a critical issue.
Permitting delays, labor availability and other factors can make or break a project's salvage and deconstruction plans. Several projects had to revise their approach in response to delays.

Training is key.
Projects using new or unskilled crews faced longer deconstruction schedules, and in some cases, increased accident rates. Invest in training for economic and worker safety reasons.

Pick your recycling facility carefully.
Recycling rates can vary dramatically between facilities (from as little as 2-4% recycling to as high as 95% or more).

Building Materials Salvage

Environmental and business development opportunity



About the project

Building type: commercial building (church)
Square feet: 4200
Construction: single story, concrete exterior walls, heavy timber, torch-down roof
Location: Ballard neighborhood, Seattle
Project completed: February 2008
Diversion method: partial deconstruction

Greenleaf Construction is a leading green homebuilder in the Seattle area, working mostly on single family residences and townhouses that use the Master Builders Association of King and Snohomish Counties' Built Green environmental home rating program. A signature Greenleaf strategy is salvaging materials from buildings slated for demolition and incorporating them into new projects.

Approach

Cedar Sound Homes, a regional homebuilder, purchased a former church building in Ballard with the aim of developing a cottage home community. The structure piqued the interest of Greenleaf. A site visit determined that the building could yield large-dimension timbers. Partial deconstruction was determined the best route for accessing the materials. Cedar Sound Construction agreed to pay for the labor to perform the partial deconstruction, in exchange for a report listing the materials salvaged.

Crews first removed a "cricket roof" (2x4 and shiplap structure held 30" above the main shiplap roof deck) with crowbars and hammers and the main shiplap to expose 2x12 roof beams, along with the lath and plaster ceiling. Then the roof members were removed, lowered

Project participants

Owner:
Cedar Sound Construction
Salvage contractor:
Greenleaf Construction
www.greenleaftconst.net
Hauler:
5th Avenue Excavation
(recycling/disposal)
5thaveexcavation.com
Greenleaf Construction
(salvage)
Recycling facility:
United Recycling
unitedrecyclingco.com

Ballard Church Salvage

This building in Seattle's Ballard neighborhood becomes a source of high-quality materials for a green homebuilder, which has added deconstruction and salvage to its business model. The 24 tons of wood salvaged from this project become source materials for the builder's current and future projects.

Resources

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Building Materials Salvage

Ballard Church Salvage Case Study

to the ground and the nails were removed by hand on sawhorses. They were then stacked and loaded into 5-ton flatbed truck for hauling to storage. This process revealed the structural 10x12 beams, which were carefully removed by track hoe. Finally, the materials were weighed and information documented.

Schedule

Early February 2008: Greenleaf initiates communications with Cedar Sound Homes
Week 1: Remove cricket roof; ceiling. Remove roof members.
Week 2: Remove beams. Weigh and document materials.

Lessons learned

The two-week window was the primary challenge on this project, compounded by several surprises. In this case, the building's roof was stripped off as part of the asbestos abatement process two weeks prior to the salvage team arriving, resulting in five inches of water in the building. Additionally, since Greenleaf's construction crew doubles as its salvage crew, existing construction projects were vying with the salvage project for time and attention.

Storage and transport of materials is an ongoing challenge; moving materials more than once or twice can create a losing economic proposition for materials reuse. Also entering into to the economic equation is the fact that carpenters often charge extra to work with salvaged materials, due to unfamiliarity and that stiff, brittle and warped wood can make for difficult work.

Greenleaf's diligent data tracking also allowed them to estimate the transportation savings from the project (35 gallons of diesel for avoided hauling), and economic development (184 labor hours and the value add of post-salvage milling services).

A major consideration for builders interested in adding salvage operations and salvaged materials use to their business models is storage of those materials for future use. Greenleaf recently started leasing space in the SoDo district of Seattle, thus allowing them to accumulate sufficient quantities of specific materials on to use projects.

Tenting and covering the salvaged materials at the final destination helped safeguard Greenleaf's salvage investment. Salvage operations are still unusual enough to garner attention by passers by: many people remarked positively about the reuse of materials—making the project a public education and marketing opportunity as well as a resource conservation effort.

Materials diverted

Material	Tons
Wood (salvaged)	24.0
Wood (recycled)	164.2
Commingled materials (recycled)	12.8
Total	**201.0**

Project cost

Labor cost to remove materials	$6356.00
Payment from developer	-$4682.00
Wood recycling	$11166.00
Commingled recycling	$924.00
Materials storage (monthly)	$1268.00
Post-salvage milling costs	$2640.00
Avoided cost of disposal*	$24120.00

*Assumes disposal costs of $120 per ton

Building Materials Salvage

Environmental and business development opportunity

About the project

Building type: single family home, one story
Square feet: 1200
Year built: 1935
Construction: wood frame, exterior brick veneer, concrete foundation
Salvage method: hybrid (partially mechanized) deconstruction
Location: Ballard neighborhood, Seattle
Project completed: September 2007

This building was slated for demolition in order to make way for a new pocket park in Ballard. Seattle Parks contacted Seattle Public Utilities (SPU) to see if SPU would be interested in using the building as a salvage case study.

Approach

SPU approached the Seattle Conservation Corps (SCC), a city service that trains youth in trade skills, to conduct the deconstruction. SCC in turn contacted a 501c3 (not for profit) deconstruction contractor. This allowed the value of the salvaged materials to be characterized as a charitable donation by the building owner—a substantial tax benefit. This approach was later abandoned.

As a result, SPU contacted a salvage consultant who evaluated the property's salvage potential and provided an estimate of time and labor required using different deconstruction techniques. The consultant estimated that manual deconstruction would require approximately nine days for a crew of five, versus three to four days for a crew of four for a hybrid, or partially mechanized approach. In addition, the consultant would train SCC staff in salvage and deconstruction skills. Contracts were signed with both SCC and Re-Use Consulting.

To receive a demolition permit, the project was required to apply for a Master Use Permit to convert the land from residential zoning to public open space. Seattle has a "no net loss"

Project participants

Owner:
Seattle Parks Department
www.seattle.gov/parks
Salvage consultant:
Re-Use Consulting
http://reuseconsulting.com
Deconstruction:
Re-Use Consulting, Seattle Conservation Corps
www.seattle.gov/parks/scc
Hauler:
Allied Waste
www.rabanco.com
Recycler:
Allied Waste; Seattle Recycling + Disposal Stations
www.seattle.gov/util
Pilot project funding:
Seattle Public Utilities
www.seattle.gov/util

Ballard Hybrid Deconstruction Training

A 1935 single family home was dismantled to make way for a small neighborhood pocket park in Seattle's Ballard neighborhood. Utilizing mechanized deconstruction methods, a total of 15-20 tons of materials were diverted from the landfill.

Resources

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Building Materials Salvage

Ballard Hybrid Deconstruction Training Case Study

housing law that requires either an approved building permit or a change of land use prior to granting a demolition permit.

Once the permit was issued, the structure was analyzed to identify hazardous materials; lead and asbestos were abated.

Salvage began by extracting interior, non-structural materials from the house. The deconstruction crew then began a *hybrid deconstruction* process, cutting the house into sections and removing the panelized elements using an outreach forklift and tractor. The panels were placed on the ground and the materials separated for reuse and recycling. The SCC deconstruction crew consisted of five laborers and two site supervisors split into two teams, one for panelizing and one for disassembling materials. Lumber and structural timbers, interior doors, kitchen cabinets, a fireplace mantle, sinks and a tub were salvaged. Unusable wood, porcelain (toilets), and metal was recycled.

Schedule

Week 1: Interior salvage; roof and main floor removed
Week 2: Structural basement timbers salvaged
Weeks 3+4: Deconstruction complete; concrete crushed for basement backfill; site cleaned.

Lessons learned

Space constraints dictated the need for a street use permit to place bins in the public right of way, adding expense to the project. Permitting processes and training the deconstruction workforce extended the project schedule. The crew's unfamiliarity with deconstruction practices likely contributed to a few minor injuries on site. In addition, the house had been vacant and boarded up, causing damage to doors and frames and reducing the value of the salvaged materials. More diligent materials tracking and identifying roles and responsibilities would have minimized mistakes (a load of recyclable wood likely ended up as demolition waste, and the asphalt shingles were not weighed). Also, recycling rates were reduced by contamination—mixing good wood with painted and/or treated wood.

The project attracted media attention, which in turn was helpful in raising awareness about salvage on projects; for example, staff at Sound Transit saw coverage of the project, leading to the Capitol Hill Redevelopment project in this Case Study series. In a private sector context, such coverage is essentially free advertising and positive public relations for the firms involved.

Materials analysis*

Material	Tons
Wood (recycled)	3.75
Metal (recycled)	0.25
Commingled demo waste** (recycled)	0.09
Commingled demo waste** (disposed)	4.41
Concrete (crushed and used as fill on site)	
Tons diverted from landfill* **	**4.09**
	Total diversion rate: 48%

* Salvaged materials tonnages are excluded from this table, due to lack of data.
** Recycling rate at Allied Waste's 3rd + Lander facility in September 2007 was 2%.
*** Concrete foundation was crushed and used on site; these tonnages are not reflected in the diversion from landfill.

Project costs

SPU contribution: deconstruction	$18000.00
Parks contribution: training	$23200.00
Parks contribution: consultant costs	$3000.00
Parks contribution: recycling + disposal	$2300.00
Total project cost	**$46,500.00**

Building Materials Salvage

Environmental and business development opportunity

About the project

Building type: two single family homes with detached garages
Square feet: 1000, 1600 (including garage)
Year built: 1920s, 1950s
Location: West Seattle
Construction: wood frame, one slab on grade foundation, one below-grade basement
Diversion method: manual deconstruction
Project completed: September 2008

These two neighboring homes were removed as part of a Seattle Public Utilities flood control program.

Approach

The homes were located on adjacent properties providing an opportunity to conduct a simultaneous "hybrid deconstruction" approach. However, schedule conflicts related to obtaining demolition permits prohibited this approach, making the houses available for deconstruction at different times.

Instead, a "controlled collapse" method was used where structural components are removed and the building cut at strategic locations, allowing sections to fall in on one another. The framing is then safely and quickly pulled from the shiplap siding. Upon inspection, the shiplap was deemed unsalvageable due to its poor condition. The salvage crew set up one bin for commingled demolition debris and one for clean wood. This approach lowers disposal costs and takes advantage of the opportunity for onsite separation of clean materials afforded by manual deconstruction.

The deconstruction process began with site safety training and a thorough review of the materials diversion plan. Inspection of the homes revealed asbestos, which was targeted for abatement. Layout of the tool area, de-nailing station, break area and roll-off cans were determined. Roll-off cans for recycling were ordered and the security plywood

Project participants

Owner:
Seattle Public Utilities
www.seattle.gov/util
Deconstruction services:
RE Store
www.re-store.org
Earthwise Salvage
www.earthwise-salvage.com
Hauler:
Grayhawk (206-248-6231)
Recycling facility:
Grayhawk
Glacier Northwest
www.glaciernw.com
Electronics recycling:
Total Reclaim
www.totalreclaim.com
Lead abatement:
Long Painting Company
www.longpainting.com .

Longfellow Creek Deconstruction

Using machinery-focused methods, an attempt is made to simultaneously deconstruct two neighboring homes to capture economic benefits and minimize costs. Timing realities, however, result in a manual deconstruction approach that still succeeds in diverting 97 percent of waste from the landfill.

Resources

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Building Materials Salvage

Longfellow Creek Deconstruction Case Study

covering the doors and windows was removed, allowing the homes to air out. Trash and household hazardous waste were disposed. Obstructing brush, telephone and cable lines were removed. Interiors were salvaged of non-structural goods.

Once permits were secured, the roofs were removed. Ferrous metals were recycled; lumber was hauled to the RE Store. The crew then executed the controlled collapse. After the walls were disassembled, the floor joists were removed. One home's cinderblock foundation had sufficiently soft mortar to allow the blocks to be salvaged; the other was crushed and recycled. Salvaged items included: wrought iron railings, fir flooring, lighting, doors, sinks, casework and cabinetry, siding, dimensional lumber, plywood, car decking, pier blocks and beams, windows, pavers, and furniture.

Schedule

Week 1: Site and crew prep. Non-structural salvage starts.
Week 2 + 3: Demolition permits secured; roofs removed; controlled collapse of House 1; floor joists removed. Foundation dismantled and cleaned. Electronics recycled.
Week 4: Roof and interior walls of second house removed.
Week 5 + 6: Garage roof removed; controlled collapse of House 2; sub-floor salvaged; foundation recycled.

Lessons learned

Schedule and permitting issues created equipment rental and work force inefficiencies and limited the source-separated materials recycling. Communication issues further compounded delays; for instance, trash remaining in the homes was not removed in advance of the salvage crew, complicating the salvage efforts.

Asbestos testing facilities may evaluate a project under the assumption that it is a conventional demolition, which relies on hazardous materials being mixed with inert materials during the demolition. This process does not occur on a deconstruction project. *All* asbestos present in a building slated for deconstruction must be abated in order to maintain the health and safety of workers.

Beginning each day with a crew check-in and safety review minimizes the chance of workplace injuries. This structure keeps productivity up, paperwork accurate, and safety at the forefront.

Project costs	
Deconstruction services	$40307.87
Recycling + disposal fees	$6883.00
Market value of salvaged materials	-$7073.00
Disposal cost savings* *Based on tons diverted; assumes $120 per ton disposal rate	-$8496.00
Total project cost	**$31,621.87**

Materials recovered		
Material	**House 1**	**House 2**
Salvage	8.5	11.9
Recycling		
- Scrap metal	1.2	1.4
- Wood	3.9	0.0
- Electronics	0.2	0.0
- Commingled	26.9	17.0
Disposal	1.2	1.2
Total generated (tons)	41.9	31.5
Total diverted (tons)	40.7	30.3
Diversion rate	**97%**	**96%**

Building Materials Salvage

Environmental and business development opportunity

About the project

Building type: 15 buildings including single- and multifamily residential, low-rise commercial
Year built: 1910-1970s
Square feet: 135,000 (15 building total)
Construction: wood frame, concrete, steel
Location: Capitol Hill neighborhood, Seattle
Project completed: In progress. Initial salvage Fall 2008; demolition to start January 2009.
Diversion method: non-structural salvage; goal for achieving 75 percent recycling rate on demolition debris

Sound Transit had planned to conventionally demolish fifteen buildings on a dense urban block of Capitol Hill to make way for a light rail station. Hearing about Seattle Public Utilities' deconstruction pilot program, they decided to find out if opportunities existed for their project.

Approach

After evaluating logistics and schedule, Sound Transit agreed to allow the Northwest Building Salvage Network to perform significant interior non-structural salvage throughout the buildings. Crews of three to four people from the REStore, Earthwise, and Second Use spent several months harvesting valuable materials from the buildings that would have otherwise been sent to the landfill. Salvaged items included: plumbing fixtures, architectural moldings and trim, doors, cabinets, hardware, fir flooring, dimensional lumber, appliances, lighting fixtures, furniture, and metal railings.

At the same time, Sound Transit was preparing to issue a Request for Proposals for demolition of the buildings. As part of their efforts to reduce waste, Sound Transit stipulated a minimum 75% recycling requirement for all demolition debris as part of the contract the first of such efforts for the organization.

NRC Environmental Services was awarded the contract and is working diligently with Sound

Project participants

Owner:
Sound Transit
www.soundtransit.org
Salvage contractor:
Northwest Building Salvage Network
Earthwise Salvage
www.earthwise-salvage.com
RE Store
www.re-store.org
Second Use
www.seconduse.com
Demolition contractor:
NRC Environmental Services
www.nrces.com

Capitol Hill Transit Redevelopment

Valuable resources are saved from 15 buildings slated for demolition to make way for Sound Transit's Capitol Hill Light Rail Station. Utilizing salvage and recycling strategies, a targeted 75 percent of the overall demolition debris will be recycled in 2009 and kept out of the landfill.

Resources

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Building Materials Salvage

Capitol Hill Transit Redevelopment Case Study

Transit and Seattle Public Utilities to explore additional salvage and deconstruction opportunities.

Schedule

Fall 2008: High-value, interior non-structural salvage complete.
January-July 2009: Demolition, with 75 percent recycling and salvage rate as a goal. May include additional salvage.

Lessons learned

This project represents two public agencies collaborating to find new ways of doing business with benefits to both the environment and taxpayers' wallets. Sound Transit's standard practice was to hire demolition contractors for work at the lowest bid. However, their interest in sustainable building practices led to a desire to evaluate different strategies for this project.

There was a learning curve for Sound Transit to institute new practices for both salvaging and for demolition contracting. Viewed as taking on additional risk, Sound Transit managers needed to feel confident that changing their business practices would not impact their schedule or their bottom line budgets.

Ensuring liability coverage was a challenge for this project. Salvage crews were only allowed to remove non-structural items, leaving any potentially valuable items that might undermine the building's structural integrity if removed. Likewise, concerns over public safety and building security meant that exterior doors and windows were off limits to the salvage team. These two issues limited the amount of materials salvaged from the project. Additionally, the building tenants had various dates for vacating the buildings. This created logistical challenges, as salvage crews needed to mobilize at various times over the course of several months and maintain clear communication with each other and with the building tenants.

Setting up procedures to address safety and cost efficiency for project required extra staff time as a result, although the project saved money on disposal costs.

Overall, the high volume of salvaged materials and the creation of new jobs for twelve laborers to perform the work resulted in a successful project.

Seattle Public Utilities and Sound Transit are currently evaluating what worked well and developing an action plan for continuing the salvage efforts in future phases of the project.

Project savings

Avoided cost of disposal*	$3552.00
Estimated market value of salvaged materials (tax deductible)**	$90000.00
Total project savings	**$93,552.00**

* Assumes 29.6 tons at disposal rate of $120 per ton
** Value of salvaged doors, windows, flooring, fixtures, etc.

Materials recovered

Salvage contractor	**Tons**
Earthwise	7.5
Second Use	14.4
RE Store	7.7
Total tons recovered*	**29.6**

* Tonnages are as of December 2008; this project's expected completion is July 2009.

Building Materials Salvage

Environmental and business development opportunity

About the project

Building type: four single-family homes
Square feet: 1000-1500 each (5500 total)
Year built: 1920s-1950s
Construction: Three wood frame homes with slab on grade foundations (one single story with detached garage, two identical two-story). One concrete masonry unit home, two stories, with perimeter foundation and crawl space.
Diversion method: non-structural salvage; demolition materials to construction and demolition recycler
Location: Wedgwood neighborhood, Seattle
Project completed: March 2008

Four houses near Thornton Creek were purchased for decommissioning by the City of Seattle (Seattle Public Utilities–SPU) due to repeated flooding in the area. The site is slated for rehabilitation into wetland and creek habitat.

Approach

For this project, the Northwest Building Salvage Network (NBSN, comprised of three Seattle area salvage companies: RE Store, Second Use Building Materials, and Earthwise Salvage) was contacted to salvage non-structural materials from the homes prior to demolition. The City of Seattle maintains a “no cost” salvage contract with the NBSN, which allows the companies to salvage materials from city-owned properties which would otherwise be sent to landfill. The salvaged materials were removed from the buildings and distributed among the three member businesses of the NBSN.

SPU then contracted with the Seattle Conservation Corps (SCC), a City service that trains youth in trade skills, to conventionally demolish the houses. Demolition debris from each of the houses was hauled to a different

Project participants

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Salvage contractors:
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Hauler:
Allied Waste
www.rabanco.com
Recyclers:
Allied Waste
Recovery 1
www.recovery1.com
CDL Recycle
www.cdlrecycle.com
Glacier Recycling
www.glacierrecycle.com

Thornton Non-Structural Salvage

Four single family homes in a flood-prone area were removed, setting the stage for a creek and habitat restoration project. Non-structural elements were salvaged from the homes, followed by conventional demolition with waste routed to recycling facilities.

Resources

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www.seattle.gov/dpd/GreenBuilding

King County GreenTools provides an online directory of recycling and salvage services for construction materials, lists recycling rates for local companies handling construction and demolition materials, and has additional deconstruction case studies.
www.greentools.us

Seattle Dept. of Planning + Development Client Assistance Memos (CAMs)
CAM 336: Reuse of Building Materials
CAM 337: Demolition Permits
CAM 1302: Building Material Salvage + Recycling
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Describes the solid waste and hazardous waste elements of demolition debris.
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For more information
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Joel Banslaben
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Seattle Public Utilities

www.seattle.gov/util

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Building Materials Salvage

Thornton Non-Structural Salvage Case Study

recycling facilities in the Seattle-Tacoma area that sort and process commingled construction and demolition waste. This was done to evaluate the recycling rates of the different facilities. The concrete masonry unit home was sent to a concrete recycler rather than to a mixed construction and demolition recycler.

After the structures were demolished, SCC crushed the foundations of the first three structures and sent the rubble to a concrete recycler. Finally, the site was filled and seeded with grass, setting the stage for habitat restoration activities. The demolition labor itself tallied by the SCC totaled 948 hours. It took an average crew of three 41 days to demolish all four houses.

Schedule

Week 1: Non-structural salvage materials removed from the four houses
Weeks 2-4: SCC crews demolish houses and send debris to recycling facilities
Week 5: Site restoration activities

Lessons learned

The project attained high diversion rates (combining salvage and recycling). However, the house made of concrete masonry units, an easily recyclable and heavy material, inflated the recycling rate. Regardless, the high diversion percentages are also due to identifying and using CDL recyclers with high facility recycling rates.

Full deconstruction would have increased diversion rates by expanding salvage opportunities to structural elements of the building. Also, working with a standard demolition contractor would likely have saved money, however the flexibility of working with SCC allowed for variations in schedule and ability to try different techniques.

Sending each home's waste to a separate demolition waste recycling facility made it difficult to track the destination of materials. Additionally, the weight of the one house, which was constructed of concrete masonry units (CMU), reduced the total salvage percentages on that project, even though the salvaged materials tonnages were quite similar.

In general, building materials salvage is a jobs creator; materials that would otherwise be mechanically demolished and sent to landfill or "downcycled" into hog fuel (burning wood for energy) or landfill cover are retained and reincorporated into the building stock. Additionally, the Seattle Conservation Corps staff received training in a new skill; one that they can apply to future projects.

Materials analysis

	Recycling facility	Recycled (tons)	Disposed (tons)	Recycling rate
House 1	Allied (3rd + Lander)	14.9	19.8	43%
House 2	Recovery 1	32.8	0.7	98%
House 3	CDL Recycle	41.2	0.8	98%
House 4*	Glacier Recycling	117.2	2.2	98%
Total		206.1	23.5	

Total diversion rate: 90%**

* House # 4 tonnage includes 75.6 tons concrete from CMU walls recycled as concrete

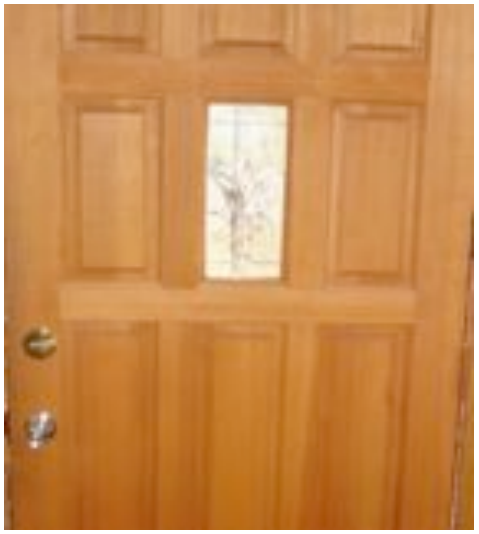
**Diversion rate = total tons recycled / total tons (does not include tons salvaged)

Project costs

"No cost" salvage contract	$0.00
Demolition labor (945 hours)	$35000.00
Demolition equipment rental	$6000.00
Commingled C+D recycling /disposal	$12645.00
Foundation hauling + recycling	$6000.00
Total project cost (four homes)	**$59,645.00**

Building Materials Salvage

Environmental and business development opportunity



About the project

Building type: two single family homes
Square feet: 1200 + 1500 (2700 total)
Construction: wood frame, 1-story and 2-story homes with below-grade basements and detached garages
Year built: 1950s
Location: Madison Valley, Seattle
Project completed: May 2008
Diversion method: non-structural salvage, recycle demolition debris

Seattle Public Utilities purchased two adjacent Madison Valley homes that had been damaged due to recurring floods in the neighborhood.

Approach

The houses were initially examined for full deconstruction (completely dismantling the structures) to maximize the potential for salvaging and recycling. However, an analysis revealed above normal levels of asbestos in the houses a common occurrence in older homes.

Making the house safe for the deconstruction crew would require expensive abatement of the hazardous materials. The diversion strategy shifted from full deconstruction to a salvage and recycling model.

First, the Northwest Building Salvage Network removed all high-value, non-structural materials from the house. Salvaged items included: interior and exterior doors, door hardware, iron railings, and plumbing and light fixtures. These items were donated to local salvaged material retailers to be re-sold. Neighborhood residents also salvaged vegetation from the two properties during this time.

Once the salvaged items were removed, a crew of three from Seattle Conservation Corps, a City service that trains youth in trade skills, performed a conventional demolition of the two houses using an excavator and loader. The demolition debris was placed in commingled recycling containers onsite and hauled to two

Project participants

Owner:
Seattle Public Utilities
www.seattle.gov/util
Salvage contractor:
Northwest Building Salvage Network
Earthwise Salvage
www.earthwise-salvage.com
RE Store
www.re-store.org
Second Use
www.seconduse.com
Hauler:
Allied Waste
www.rabanco.com
Recycling facilities:
Recovery 1
www.recovery1.com
CDL Recycle
www.cdlrecycle.com
Renton Concrete Recyclers
rentonconcreterecyclers.com

Madison Valley Salvage

Two Madison Valley homes located in flood-prone areas are torn down and recycled as part of Seattle Public Utilities' Flood Control Program. Salvage and recycling the water-damaged homes avoided the generation of more than 96 tons of demolition waste.

Resources

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Building Materials Salvage

Madison Valley Salvage Case Study

different material recovery facilities (CDL Recycling in Seattle and Recovery 1 in Tacoma). Both facilities sort demolition debris and separate out materials for recycling.

Concrete foundations from the houses were crushed onsite and used to backfill the basements prior to installing topsoil and grass seed. Extra concrete that was not used for backfill was hauled to Renton for recycling.

Schedule

Week 1: Salvage of interior non-structural high-value items and plantings.
Week 2 & 3: Demolition of structures.
Week 4: Demolition completed and material recycled. Site prepared with topsoil and seed.

Lessons learned

Older homes containing asbestos, lead paint and other hazardous materials can make efforts to deconstruct and salvage large portions of existing structures financially challenging. Choosing to selectively salvage high-value items and recycle as much as the demolition debris as possible is a good alternative to full deconstruction in these instances. Hauling demolition debris to material recovery facilities that sort materials and achieve a high rate of recycling will yield the best diversion rates for a project.

For the Madison Valley homes, the demolition costs to use the Seattle Conservation Corps (SCC) were slightly higher than utilizing a standard demolition contractor based on level of experience and costs to rent equipment. However, utilizing SCC's services provided greater flexibility for Seattle Public Utilities in terms of scheduling and payment. Overall, the project's high diversion rate coupled with the creation of over 320 labor hours to salvage and recycle the houses resulted in a successful effort by Seattle Public Utilities to save valuable materials from the landfill and provide new job opportunities within the community.

Project costs

Salvage (labor)*	$0.00
Demolition (labor + equipment)	$16500.00
Hauling	$7500.00
Recycling (CDL Recycle)	$4088.50
Recycling (Recovery 1)	$4000.00
Total project cost	**$32,088.50**
Cost savings over conventional disposal**	$4000.00
Projected market value of salvaged materials (tax deductible)	$740.00

* Salvage labor costs offset by value of materials.
* * Assumes a disposal cost of $120 per ton.

Materials analysis

Material	Amount (tons)
Salvaged items	0.8
Commingled recycling	94.0
Disposed	2.0
Total tons generated	96.8
Total tons diverted from landfill	94.8
Diversion rate*: 98%	

* Diversion rate = total tons diverted / total tons generated

Building Materials Salvage

Environmental and business development opportunity

About the project

Building type: single family home
Square feet: 1680
Construction: wood frame, two story, below-grade basement, detached garage
Year built: 1908
Location: Fremont neighborhood, Seattle
Project completed: September 2008
Diversion method: house moving

This 1905 Craftsman house had recently been painstakingly restored by its owners, who operated the home as a bed and breakfast. The neighborhood historical society considers the home one of the most architecturally significant houses of the Fremont neighborhood. However, the City of Seattle has promoted Fremont as an "urban village" and as a result development in the area nearest to shops and restaurants is often focused on increasing density where single family homes existed. As a result, developers purchased the home for the purpose of building townhouses, and the house was scheduled to be demolished in Fall 2008.

Approach

The neighborhood and the Fremont Historical Society helped bring media attention to the house in hopes that it would be spared from demolition. They approached Nickel Bros. House Moving who quickly listed the threatened house on its website and were successful in finding a local property owner with plans to build a new home on his lot. The owner decided to move the existing lot to his property instead of building new.

Nickel Bros. prepared the house for moving by installing extra bracing, removing the basement wall and ceiling finishes, and loading the house onto two large structural beams. Dollies were placed under the rear portion of the beams while a tractor-truck was hooked to the front. The move was scheduled from 2:00 a.m. to 11:00 a.m. on Saturday evening so as not to disrupt daytime traffic in the house's fifteen

Project participants

Owner: Private owner
House moving: Nickel Bros. House Moving
www.nickelbros.com
Project support: Seattle Public Utilities
www.seattle.gov/util

Fremont House Move

A historically significant 1905 home in Seattle's Fremont neighborhood is spared from demolition by a whole-house move from its original location to a nearby lot. The move resulted in the reuse of 85 tons of materials and an estimated $100,000 savings to the new owner, compared to building new.

Resources

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Building Materials Salvage

Environmental and business development opportunity

block journey to its new location. Overhead utility wires had to be temporarily taken down along the move route and some low-lying trees had to be pruned and/or removed and replaced along the street. The remaining concrete foundation was later crushed for recycling. Some elements of the single-car garage were salvaged including; the garage door, windows, siding, trim, and dimensional lumber. The remainder of the garage was then demolished and disposed, along with the basement finishes.

Schedule

Within the twelve weeks that Nickel Bros. House Moving received word from the Fremont Historical Society of the house's impending demolition, the company was able to find a receiving property, secure all necessary permits, prepare the house and perform the move.

Lessons learned

The house move was successful from a triple bottom line approach. The developer saved money on demolition and disposal costs. The owner's total cost for the move ($140,000) was offset by the house value on the receiving property, which is expected to be approximately $350,000. With other finishing costs expected to total $100,000, the owner is receiving a historic-quality house for about $100,000 less than its projected appraisal value. House moving also helps save valuable resources and lessens environmental impact by reducing the demand for virgin materials for new housing.

The house move itself was particularly challenging given the house's height and the narrow streets in the residential Fremont neighborhood. The move route involved traversing an extremely steep hill and the moving logistics involved a great deal of upfront planning. The move took about twenty percent longer than expected and the utility wire moving costs roughly doubled based on the challenges on the route. A better understanding of the obstacles along the tight move route would have helped the house mover and the owner better anticipate moving costs.

In spite of the challenges, this project saved approximately 85 tons of demolition waste from disposal and created local job opportunities equivalent to roughly 200-person hours for Nickel Bros. House Moving. The project also earned large amounts of media attention, providing education to the public house moving as a method for saving valuable resources from disposal.

Project costs + benefits	
House move (includes permits, moving, utility line management, tree pruning + replacement	-$140000.00
Estimated remodel cost, post-move	-$100000.00
Avoided disposal fees*	$10200.00
Estimated value of house, post-move	$350000.00
Savings over demolition/new construction	**$120,200.00**
* Assumes $120 per ton disposal rates	

Materials analysis	
Material	**Tons**
House (reused)	85.0
Concrete foundation (recycled)	49.5
Basement finishes (disposed)	2.0
Total tons generated	136.5
Total tons diverted from landfill	**134.5**
Total diversion rate: 98.5%	